

REMARKS

The references cited in the February 9, 2007 Office Action have been received and carefully studied. Applicant acknowledges with appreciation the allowability of claims 66, 88, 92, 96 and 100 and the indicated allowability, subject to being rewritten in independent form, of claims 54, 61, 70 and 101-104. Claims 101-104 have been cancelled and rewritten in independent form as newly added claims 105-108, all limited to a catalyst containing scoria in accordance with paragraph 8, page 7 of the Office Action. Claims 54 and 61 have been amended to be in independent form and recite a catalyte composition comprising an admixture of water and the reaction products of certain particles. Claim 70 has been rewritten in independent form.

It is noted that the rejections set forth in the previous Office Action have been withdrawn and, upon further consideration, two new grounds of rejection have been made under 35 U.S.C. 103.

To emphasize the distinction over the cited reference, Applicant has now amended the claims directed to the process for upgrading hydrocarbon, namely, claim 85, 89, 93, and 97 to recite more explicitly that the reaction occurs in "the liquid phase". It is respectfully submitted that this limitation is clearly supported by the disclosure, note particularly, the examples set forth in the specification.

Rejections under 35 U.S.C. 103

1. Claims 52, 53, 55, 60, 62-65, 67-69, 71 and 73-75 have been rejected as unpatentable over Hettinger, Jr. (U.S. Pat. No. 4,450,241) in view of Hettinger 2 (U.S. Pat. No. 4,469,588) and Zones (U.S. Pat. No. 5,958,370). These claims are directed to catalyst compositions and methods of making the same.

Hettinger, Jr.

As noted in the prior response, Hettinger Jr., is concerned with the periodic regeneration of spent catalysts used in the catalytic vapor phase fluidized conversion of high boiling hydrocarbons. To this extent, the reference has little application to catalysts used in the

liquid phase conversion of high boiling hydrocarbons. The main objective of Hettinger, Jr. is the preparation of a catalyst with metal additions to reduce deactivation of catalyst sites in a zeolite during catalyst regeneration. Alternatively, CO₂ gas is relied on to regenerate the catalyst usually at temperatures from 1350°F to about 1500°F. (Col. 4, lines 20-49). Accordingly, one skilled in the art would not regard Hettinger, Jr.'s teaching as relevant to the development of a catalyst for a liquid phase reaction.

In applying Hettinger Jr. as the primary reference, the Examiner does not appear to recognize the distinction between the catalysts described therein and that discovered by the Applicant. In Applicant's invention a unique selection of particles are mixed with water to form reaction products which serve as the active catalysts. These reaction products, while still in the form of an aqueous admixture, are then blended with a heavy hydrocarbon feedstock while it too is in the liquid phase. The reaction then proceeds to completion in the liquid phase, though often generating light hydrocarbon vapors.

In contrast, Hettinger, Jr., as described in the paragraphs cited by the Examiner (col. 7, lines 34-51 and col. 8, lines 15-32) shows the manufacture of a catalyst by initially forming a catalyst slurry and thereafter spray drying it to form microspheres: a finished catalyst in solid form. The "steam, naphtha, carbon dioxide or combinations thereof" referred to in the patent (col. 8, lines 27-32) do not form an aqueous mixture of the catalyst, but rather are "lift gas[es]" which suspends the solid microspheres in the riser reactor. It does not form a catalyst in an aqueous mixture, a basic element of the claimed catalysts and the claimed method of preparation. Furthermore, since, as recognized by the Examiner, "Hettinger does not disclose a catalyst composition claiming silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide, and a transition metal salt" even if this reference taught the formation of a catalyst in an aqueous medium, it could not be said that it would form one containing the reaction products essential to Applicant's inventive catalyst.

Hettinger 2

The secondary reference, Hettinger 2, describes the formation of "high pore volume solid sorbent material of low cracking activity . . . employed to effect the demetallization and

decarbonization of heavy oil feed” (Abstract). This paragraph makes apparent that, as in the case of Hettinger, Jr., this reference is concerned with the formation of a solid catalyst. In fact, the portion of the specification cited by the Examiner shows that the catalyst is used as a solid, rather than as a liquid. While the disclosure on column 25 teaches milling of solid components in the presence of tap water, the subsequent steps of the process (col. 25, lines 39-68) describes the formation of a fluidizable microspherical solid.

Hettinger 2 shows the use of certain oxides to make a solid catalyst; however, it does not include the essential transition metal, an element of all of the Applicant’s claims, nor any disclosure that the catalyst described would be useful for hydrogenation and cracking. Rather, Hettinger 2’s objective is to produce a suitable grade of oil feed material from residual hydrocarbons having lowered metals and Conradson carbon values for use as a feed for fluidized catalytic cracking. It is concerned with producing a feedstock useful for cracking, rather than for cracking itself. As noted in the Abstract it is desirable for the sorbent material to have “low cracking activity.” This objective teaches away from Applicant’s objective, which is to produce an active and efficient cracking catalyst. Hence, one skilled in the art would not regard this reference as useful for preparing a catalyst for the cracking of heavy hydrocarbons.

Zones

With regard to the newly cited Zones reference, the Examiner mistakenly describes cobalt halide as a preferred hydrogenation catalyst, citing column 9, lines 25-44. In fact, cobalt halide is never specifically named, though each of these two moieties is included in lists of metals and anions named in the cited passage. Certainly, there is no teaching that a salt formed from cobalt and a halide would be preferable, nor is such a salt exemplified.

More specifically, the reference to cobalt, a transition metal, is included in a list of numerous metals or metal ions which, when added to the zeolite, may be capable of catalyzing the reduction of oxides to nitrogen. The bulk of the metals listed are not transition metals and the elemental metals as well as non-salt forming anions are mentioned. Accordingly, one skilled in the art would not believe that cobalt or any other transition metal salt would be desirable for inclusion in a cracking catalyst, particularly, in combination with the other components in

applicant's claimed catalyst. The remoteness of this reference to Applicant's invention is made particularly clear when the preferred objective of Zones is noted. On col. 3, lines 35-40 it is stated that a preferred embodiment is the treatment of an "exhaust stream of an internal combustion engine".

While it is recognized that the catalyst in Zones is said to be useful in hydrocarbon conversion processes (column 8) and hydrocracking (column 9), the essential teaching relates to an entirely different subject matter, namely, the formation and use of a specifically modified zeolite SSZ-39. Hence, one skilled in the art would not have been motivated to select a transition metal salt, one not named specifically or identified as a transitional metal salt, from a laundry list including sundry elements and compounds. And, finally, Zones does not have any disclosure of using an aqueous mixture as a catalyst or in using such catalyst in a liquid phase process.

For the foregoing reasons, one of ordinary skill in the art would not have been motivated to combine Zones with Hettinger and Hettinger 2. Even if, arguably, there was such a motivation, the combined references would not yield the liquid phase of the present invention.

2. Claims 76, 78-80, 82-87, 89-91, 93-95, 97-99 have also been rejected under 35 U.S.C. 103(a) as unpatentable over Hettinger, Jr. in view of Hettinger 2 and Zones.

The discussion set forth in Section 1 above is clearly applicable to the methods of catalyst preparation and the process for cracking high molecular hydrocarbons disclosed in the above claims and, in order not over burden the record, such remarks will not be repeated here. It is respectfully requested, however, that the Examiner consider the arguments set forth in Section 1. Suffice it to say that the claims 85-87, 89-91, 93-95, 97-99, since they are restricted to a particular use of the inventive catalyst, are unobvious and patentable for even a greater reason.

Most fundamentally, none of the cited reference show liquid phase cracking and hydrogenation of high molecular weight hydrocarbons to reduce their viscosity. Secondly, and as an independent basis for patentability, such art fails to show a catalyst that is active in an aqueous medium and is admixed with a liquid feedstock. Such catalysts are distinguishable from

catalysts which are prepared by blending their constituent elements in water, but are ultimately dried and used in particulate form as in the cite prior art.

A process which can effectively crack high molecular weight materials in the liquid phase is far more economical than the vapor phase process disclosed in the prior art. The simplicity of the process is apparent. The heat requirements necessary to vaporize the feedstock and the cooling requirements to recover the products are minimized. The equipment used need not withstand the rigors of high pressure and high temperature and the intimate contacting of the catalyst and the high molecular weight hydrocarbons simplified. These are most surprising and unexpected results, potentially having enormous commercial interest.

Mason

In connection, with this rejection, the Examiner refers to Mason (U.S. Pat. No. 2,497,176). Applicant does not contest that Mason shows metals may be supported on Portland cement and pumice or that these two materials may act as carriers. Applicant's catalyst, while it may use Portland cement to form the catalyst, does not act as a support, nor does it act as a carrier.

CONCLUSION

Accordingly, it is respectfully requested that the Examiner acknowledge the Applicant's contribution and allow the remaining claims of the application. A Notice to that effect will be greatly appreciated.

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